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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/063,331	04/12/2002	David M. Fried	BUR920010172	8745

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EXAMINER	
PHAM, HOAI V	

ART UNIT	PAPER NUMBER
2814	

DATE MAILED: 09/21/2004

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	10/063,331	FRIED ET AL.	
	Examiner	Art Unit	
	Hoai v Pham	2814	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *30 June 2004* .

2a)☒ This action is **FINAL**. 2b)☐ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-4,6,8,10,11,20-22,24,25,27 and 29-34* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☒ Claim(s) *10 and 11* is/are allowed.

6)☒ Claim(s) *1-4,6,8,20-22,24,25,27,32 and 34* is/are rejected.

7)☒ Claim(s) *29-31 and 33* is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

11)☒ The proposed drawing correction filed on *19 June 2003* is: a)☒ approved b)☐ disapproved by the Examiner.

If approved, corrected drawings are required in reply to this Office action.

12)☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. §§ 119 and 120

13)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____ .

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

14)☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).

a) ☐ The translation of the foreign language provisional application has been received.

15)☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

Attachment(s)

1) ☐ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO-1449) Paper No(s) _____ .
4) ☐ Interview Summary (PTO-413) Paper No(s). _____ .
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: .

DETAILED ACTION

Claim Rejections - 35 USC § 112

1. The following is a quotation of the first paragraph of 35 U.S.C. 112:

> The specification shall contain a written description of the invention, and of the manner and process of making and using it, in such full, clear, concise, and exact terms as to enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to make and use the same and shall set forth the best mode contemplated by the inventor of carrying out his invention.

2. Claims 2-3 and 21-22 are rejected under 35 U.S.C. 112, first paragraph, as containing subject matter which was not described in the specification in such a way as to reasonably convey to one skilled in the relevant art that the inventor(s), at the time the application was filed, had possession of the claimed invention.

Claims 2 and 21, the phrase "a first interconnect connected to one of the top surface, the first side surface, and the second side surface of the Fin structure" is not described in the specification and the figure. Since the specification and the drawing shown that Fin structure is a layer (206) and layer (212) is a conductor structure.

Claim Rejections - 35 USC § 103

3. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

4. This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of

the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

5. Claims 1, 3, 4, 8 and 34 are rejected under 35 U.S.C. 103(a) as being unpatentable over Inoue et al. [U.S. Pat. 6,407,442] previously applied, in view of Ting [U.S. Pat. 5,838,032] previously applied.

With respect to claim 1, Inoue et al. (fig. 2, cols. 4-6) discloses a capacitor formed on a substrate (101), comprising:

a Fin structure (103) having a top surface and a first side surface opposite a second side surface, said Fin structure including conductivity enhancing dopant ions in a semiconductor material (see col. 4, lines 62-63);

an insulator structure (144) adjacent the top surface of the Fin structure (see col. 4, line 64); and

a conductor structure (105a) adjacent the insulator structure (see col. 4, lines 64-65), wherein all conducting material on a top surface of the insulator structure is continuously distributed on the top surface of the insulator structure (144) and is comprised by the conductor structure (105a), wherein the conductor structure partially but not totally overlays the Fin structure, and wherein a thickness of the conductor structure is within a thickness of the Fin structure, said thickness of the Fin structure

being a distance between the first and second side surfaces of the Fin structure, said thickness of the conductor structure being oriented in a same direction as said thickness of the Fin structure, said insulator structure comprising a single insulative material distributed from the top surface of the Fin structure to a bottom surface of the conductor structure (see fig. 2).

Inoue et al. does not disclose the Fin structure including a single-crystal semiconductor material. However, Ting discloses that the lower electrode (23) can be formed of single-crystal semiconductor material (see col. 4, lines 42-44). Therefore, it would have been obvious to one having skill in the art at the time the invention was made to select single-crystal semiconductor material as known materials, as taught by Ting into the device of Inoue et al. to form the lower electrode. Moreover, selection of a known material based on its suitability for its intended use supported a prima facie obviousness determination in Sinclair & Carroll Co., Inc. v. Interchemical Corp., 325 U.S. 327, 65 USPQ 297 (1945).

With respect to claim 3, Inoue et al. discloses that a second interconnect (107) connected to the conductor structure (105a) (see fig. 2).

With respect to claim 4, Ting discloses that the conductor structure (25) includes a conductive material consisting of a metal (see col. 4, lines 44-46).

With respect to claim 6, Inoue et al. does not teach the exact height range of their Fin structure, as claimed by Applicant. However, the height range would have been obvious to an ordinary artisan practicing the invention because, absent evidence of disclosure of criticality for the range giving unexpected results, it is not inventive to discover optimal or workable ranges by routine experimentation. *In re Aller*, 220 F.2d 454, 105 USPQ 233, 235 (CCPA 1955). Therefore, it would have been obvious to one having skill in the art at the time the invention was made to select the height range of the Fin structure in an integrated circuit for different application.

With respect to claim 8, Inoue et al. discloses that a FinFET (110, 111) is disposed on the substrate, the FinFET having a gate electrode (105) coupled to said conductor structure (see fig. 2 and col. 5, lines 10-18).

With respect to claim 34, Ting discloses that the thickness of the Fin structure is greater than 40 nm. It is noted that, the height of the Fin structure (23) is between about (2700-3300 Angstrom = 270-330 nm) (see col. 3, lines 60-64). Therefore, the length thickness of the Fin structure (23) is inherently greater than 40 nm.

6. Claims 1, 3, 4, 32 and 34 are rejected under 35 U.S.C. 103(a) as being unpatentable over Natsume [U.S. Pat. 5,356,826] previously applied, in view of Ting [U.S. Pat. 5,838,032] previously applied.

With respect to claim 1, Natsume (fig. 12, cols. 4-6) discloses a capacitor formed on a substrate (100), comprising:

a Fin structure (L1) having a top surface and a first side surface opposite a second side surface, said Fin structure including polycrystalline silicon material (see col. 5, lines 1-3);

an insulator structure (1) adjacent the top surface of the Fin structure (L1) (see col. 5, line 10-15); and

a conductor structure (L2) adjacent the insulator structure (1) (see col. 6, lines 5-12), wherein all conducting material on a top surface of the insulator structure is continuously distributed on the top surface of the insulator structure (1) and is comprised by the conductor structure (L2), wherein the conductor structure partially but not totally overlays the Fin structure, and wherein a thickness of the conductor structure is within a thickness of the Fin structure, said thickness of the Fin structure being a distance between the first and second side surfaces of the Fin structure, said thickness of the conductor structure being oriented in a same direction as said thickness of the Fin structure, said insulator structure comprising a single insulative material (see col. 5, lines 10-11) distributed from the top surface of the Fin structure to a bottom surface of the conductor structure (see fig. 12).

Natsume does not disclose the Fin structure including a single-crystal semiconductor material. However, Ting discloses that the lower electrode (23) can be formed of single-crystal semiconductor material (see col. 4, lines 42-44). Therefore, it would have been obvious to one having skill in the art at the time the invention was made to select single-crystal semiconductor material as known materials, as taught by Ting into the device of Natsume to form the lower electrode. Moreover, selection of a known material based on its suitability for its intended use supported a prima facie obviousness determination in Sinclair & Carroll Co., Inc. v. Interchemical Corp., 325 U.S. 327, 65 USPQ 297 (1945).

With respect to claim 3, Natsume discloses that a second interconnect (CN) connected to the conductor structure (L2) (see fig. 12).

With respect to claim 4, Natsume discloses that the conductor structure (L2) includes a conductive material consisting of a metal (see col. 6, lines 8-11).

With respect to claim 6, Natsume does not teach the exact height range of their Fin structure, as claimed by Applicant. However, the height range would have been obvious to an ordinary artisan practicing the invention because, absent evidence of disclosure of criticality for the range giving unexpected results, it is not inventive to discover optimal or workable ranges by routine experimentation. *In re Aller*, 220 F.2d 454, 105 USPQ 233, 235 (CCPA 1955). Therefore, it would have been obvious to one

having skill in the art at the time the invention was made to select the height range of the Fin structure in an integrated circuit for different application.

With respect to claim 32, Natsume discloses that an insulator layer (3) such that an entire bottom surface of the Fin structure (L1) is in direct mechanical contact with a top surface of the insulator layer (3); and an insulation film (8) on the side surface of the Fin structure (L1) and direct mechanical contact with the first side surface of the Fin structure, wherein the insulator structure has a lower surface and an upper surface such that a height of the lower surface of the insulator structure above the top surface of the insulation film is less than a height of the upper surface of the insulator structure above the top surface of the insulator layer, and wherein a height of a top surface of the insulation film above the top surface of the insulator layer is greater than the height of the lower surface of insulator structure and less the height of the upper surface of the insulator strucrure (see fig. 12).

With respect to claim 34, Ting discloses that the thickness of the Fin structure is greater than 40 nm. It is noted that, the height of the Fin structure (23) is between about (2700-3300 Angstrom = 270-330 nm) (see col. 3, lines 60-64). Therefore, the length thickness of the Fin structure (23) is inherently greater than 40 nm.

7. Claims 20, 22, and 24-25 are rejected under 35 U.S.C. 103(a) as being unpatentable over Ishii [U.S. Pat. 6,627,936] previously applied, in view of Ting [U.S. Pat. 5,838,032] previously applied.

With respect to claim 20, Ishii (fig. 9, cols. 3-4) discloses a capacitor formed on a substrate (1), comprising:

a Fin structure (5) having a top surface (5a) and a first side surface opposite a second side surface;

an insulator structure (6) adjacent the top surface of the Fin structure (5);

a conductor structure (7) adjacent the insulator structure (6), wherein the conductor structure overlays the Fin structure, wherein a thickness of the Fin structure is within a thickness of the conductor structure, said thickness of the Fin structure being a distance between the first and second side surfaces of the Fin structure, said thickness of the conductor structure being oriented in a same direction as said thickness of the Fin structure, said insulator structure comprising a single insulative material distributed from the top surface of the Fin structure to a bottom surface of the conductor structure (see fig. 9).

an insulator layer (8) (see col. 3, lines 38-45) such that an entire bottom surface of the Fin structure (5) is in direct mechanical contact with a top surface of the insulator layer (8) (see fig. 9).

Ishii does not disclose the Fin structure including a single-crystal semiconductor material. However, Ting discloses that the lower electrode (23) can be formed of single-crystal semiconductor material (see col. 4, lines 42-44). Therefore, it would have been

obvious to one having skill in the art at the time the invention was made to select single-crystal semiconductor material as known materials, as taught by Ting into the device of Ishii to form the Fin structure. Moreover, selection of a known material based on its suitability for its intended use supported a prima facie obviousness determination in Sinclair & Carroll Co., Inc. v. Interchemical Corp., 325 U.S. 327, 65 USPQ 297 (1945).

With respect to claim 22, Ting discloses that a second interconnect (30) connected to the conductor structure (25) (see fig. 6 and col. 4, lines 15-19).

With respect to claims 24-25, Ishii does not teach the exact thickness and height range of their Fin structure, as claimed by Applicant. However, the thickness and height range would have been obvious to an ordinary artisan practicing the invention because, absent evidence of disclosure of criticality for the range giving unexpected results, it is not inventive to discover optimal or workable ranges by routine experimentation. *In re Aller*, 220 F.2d 454, 105 USPQ 233, 235 (CCPA 1955). Therefore, it would have been obvious to one having skill in the art at the time the invention was made to select the thickness and the height range of the Fin structure in an integrated circuit for different application.

8. Claim 27 is rejected under 35 U.S.C. 103(a) as being unpatentable over Ishii [U.S. Pat. 6,627,936] previously applied, in view of Ting [U.S. Pat. 5,838,032] previously applied, as applied to claim 20 above, and further in view of Inoue et al. [U.S. Pat. 6,407,442] previously applied.

As discussed in details above, the combination of Ishii and Ting substantially disclose all the limitations as claimed above except a FinFET is disposed on the substrate, the FinFET having a gate electrode coupled to said conductor structure. However, Inoue et al. discloses that the FinFET (110 or 111) is disposed on the substrate (101), the FinFET having a gate electrode (105) coupled to said conductor structure (105a) (see fig. 13). Therefore, it would have been obvious to one having skill in the art to include the FinFET disposed on the substrate and the FinFET having a gate electrode coupled to the conductor structure in the Ishii's device in order to operate the device.

Allowable Subject Matter

9. Claims 10-11 are allowed.

10. Claims 29-31 and 33 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

Response to Arguments

11. Applicant's arguments with respect to claims 1-4, 6, 8, 20-22, 24-25, 27, 32 and 34 have been considered but are moot in view of the new ground(s) of rejection.

Applicant argues that Ishii does not teach or suggest the feature: "an insulator layer such that an entire bottom surface of the Fin structure is in direct mechanical contact with a top surface of the insulator layer".

Applicant's arguments are not persuasive because Ishii clearly discloses that an insulator layer (8) (see col. 3, lines 38-45) such that an entire bottom surface of the Fin structure (5) is in direct mechanical contact with a top surface of the insulator layer (8) (see fig. 9).

Conclusion

12. Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

13. A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of

the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

14. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Hoai v Pham whose telephone number is 571-272-1715. The examiner can normally be reached on M-F.

15. If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Wael M Fahmy can be reached on 571-272-1705. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

16. Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

Hoai Pham
Patent Examiner